

GEOS pressure/vertical levels ...

[rburns](#) 60 posts since

May 22, 2007 Hey Bill,

I was trying to find a table that correlated the vertical levels in the model with their appropriate pressure value. So if I have say 250 and 800mb levels what is their vertical level number? I am dealing with the 72 level grid.

Is this documented anywhere?

Thanks,

Rob Tags: levels, pressure

[rburns](#) 60 posts since

May 22, 2007 **1. Re: GEOS pressure/vertical levels** Jan 9, 2008 3:17 PM

FROM BILL PUTMAN:

A table gets written to stdout during the job execution, here is the 72-level config you're looking for Pref(k) in mb:

k A(k) B(k) Pref DelP

1	0.010000	0.0000	0.0100
2	0.020000	0.0000	0.0200
3	0.032700	0.0000	0.0327
4	0.047585	0.0000	0.0476
5	0.066000	0.0000	0.0660
6	0.089345	0.0000	0.0893
7	0.119703	0.0000	0.1197
8	0.159495	0.0000	0.1595
9	0.211349	0.0000	0.2113
10	0.278526	0.0000	0.2785
11	0.365041	0.0000	0.3650
12	0.475806	0.0000	0.4758
13	0.616779	0.0000	0.6168
14	0.795134	0.0000	0.7951

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15 1.019440 0.0000 1.0194 0.2243
16 1.300510 0.0000 1.3005 0.2811
17 1.650790 0.0000 1.6508 0.3503
18 2.084970 0.0000 2.0850 0.4342
19 2.620211 0.0000 2.6202 0.5352
20 3.276431 0.0000 3.2764 0.6562
21 4.076571 0.0000 4.0766 0.8001
22 5.046801 0.0000 5.0468 0.9702
23 6.216801 0.0000 6.2168 1.1700
24 7.619842 0.0000 7.6198 1.4030
25 9.292942 0.0000 9.2929 1.6731
26 11.276902 0.0000 11.2769 1.9840
27 13.643402 0.0000 13.6434 2.3665
28 16.457103 0.0000 16.4571 2.8137
29 19.791604 0.0000 19.7916 3.3345
30 23.730405 0.0000 23.7304 3.9388
31 28.367805 0.0000 28.3678 4.6374
32 33.810007 0.0000 33.8100 5.4422
33 40.175409 0.0000 40.1754 6.3654
34 47.643910 0.0000 47.6439 7.4685
35 56.387909 0.0000 56.3879 8.7440
36 66.603412 0.0000 66.6034 10.2155
37 78.512313 0.0000 78.5123 11.9089
38 92.365721 0.0000 92.3657 13.8534
39 108.663015 0.0000 108.6630 16.2973
40 127.837028 0.0000 127.8370 19.1740
41 150.393024 0.0000 150.3930 22.5560
42 176.930035 0.0000 176.9300 26.5370
43 201.192007 0.0070 208.1520 31.2220
44 216.865015 0.0280 244.8751 36.7230
45 224.363003 0.0637 288.0831 43.2080
46 223.898003 0.1136 337.5001 49.4170
47 218.775972 0.1562 375.0001 37.5000
48 212.149976 0.2004 412.5001 37.5000
49 203.258980 0.2467 450.0001 37.5000
50 193.096949 0.2944 487.5001 37.5000
51 181.618961 0.3434 525.0001 37.5000
52 169.608961 0.3929 562.5001 37.5000

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```
53 156.259957 0.4437 600.0001 37.5000
54 142.909948 0.4946 637.5001 37.5000
55 128.695935 0.5463 675.0001 37.5000
56 118.958620 0.5810 700.0001 25.0000
57 109.181707 0.6158 725.0001 25.0000
58 99.365213 0.6506 750.0002 25.0000
59 89.099920 0.6859 774.9998 24.9997
60 78.834217 0.7212 800.0002 25.0003
61 70.621981 0.7494 820.0002 20.0000
62 64.362635 0.7706 835.0001 15.0000
63 58.053212 0.7919 850.0002 15.0000
64 51.696107 0.8133 865.0001 14.9999
65 45.339008 0.8347 880.0000 14.9999
66 38.982008 0.8560 895.0000 15.0001
67 32.570807 0.8774 909.9998 14.9998
68 26.092006 0.8989 925.0000 15.0002
69 19.613105 0.9204 940.0001 15.0001
70 13.134803 0.9419 954.9998 14.9997
71 6.593752 0.9634 969.9998 14.9999
72 0.048048 0.9850 985.0000 15.0002
73 0.000000 1.0000 1000.0000 15.0000
```

[rburns](#) 60 posts since

May 22, 2007 [2.](#) Re: GEOS pressure/vertical levels Jan 9, 2008 3:25 PM

in response to: [rburns](#)

I'm a bit of a GEOS novice, so maybe you can explain something to me.

I was expecting a vertical level to correspond to a specific, consistent pressure value, e.g. level 50 always equals pressure 500mb, for example. It appears that the vertical levels are calculated somewhat differently then. Can you explain?

Some background: I am trying to perform a wind shear calculation in a research project. Since the WMS viewer uses the 200mb and 850mb pressure level to perform the calculation, I assumed these would correspond to level X and Y in the 72 value range.

Thanks for any insight.

Rob

[wputman](#) 22 posts since

Aug 16, 2007 [3.](#) Re: GEOS pressure/vertical levels Jan 9, 2008 3:46 PM

GEOS pressure/vertical levels ...

in response to: [rburns](#) The distribution of vertical levels in the model is based on a choice of ak's and bk's, parameters used to describe the vertical coordinate in the model. GEOS uses a hybrid sigma-pressure coordinate to avoid having model levels on constant pressure surfaces that would intersect with the ground, so in the list I sent, anywhere that bk is 0 is a constant pressure surface, elsewhere it is a sigma level.

If you want to do a shear calculation you have to interpolate to the levels you're interested in. GEOS offers many standard quantities as 2D export fields on various pressure levels (ie: 850, 500, and 250mb quantities for U, V, T, Q and H) or you can tell the history what levels you want to write out on, for example:

```
list(1)%filename: 'geos_ex',
list(1)%template: '%y4%m2%d2_%h2%n2z',
list(1)%format: 'CFIO',
list(1)%mode: 'time-averaged',
list(1)%frequency: 240000,
list(1)%ref_time: 210000,
list(1)%levels: 1000 850 600 500 250,
list(1)%fields: 'U' , 'DYN' ,
'V' , 'DYN' ,
'T' , 'DYN' ,
'PS' , 'DYN' ,
'DELP' , 'DYN' ,
'Q' , 'MOIST' ,
::
:
```

or for 2D field examples see below...

```
list(2)%filename: 'geosgcm_diag',
list(2)%template: '%y4%m2%d2_%h2%n2z',
list(2)%format: 'CFIO',
list(2)%mode: 'time-averaged',
list(2)%frequency: 240000,
list(2)%ref_time: 210000,
list(2)%fields: 'SLP' , 'DYN' ,
'PS' , 'DYN' ,
'U850' , 'DYN' ,
'U500' , 'DYN' ,
'U250' , 'DYN' ,
'V850' , 'DYN' ,
'V500' , 'DYN' ,
'V250' , 'DYN' ,
'T850' , 'DYN' ,
'T500' , 'DYN' ,
```

GEOS pressure/vertical levels ...

```
'T250' , 'DYN' ,  
'Q850' , 'DYN' ,  
'Q500' , 'DYN' ,  
'Q250' , 'DYN' ,  
'OMEGA500' , 'DYN' ,  
'OSR' , 'SOLAR' , 'SWUPTOA' ,  
'RSR' , 'SOLAR' , 'SWNETTOA' ,  
'SLRTP' , 'SOLAR' , 'SWDWNTOA' ,  
'SLRSF' , 'SOLAR' , 'SWDWNSRF' ,  
'RSRS' , 'SOLAR' , 'SWNETSRF' ,  
'U10M' , 'SURFACE' ,  
'V10M' , 'SURFACE' ,  
'T10M' , 'SURFACE' ,  
'Q10M' , 'SURFACE' , 'QV10M' ,  
'TS' , 'SURFACE' , 'TSRAD' ,  
'TROPP' , 'AGCM' ,  
'TROPQ' , 'AGCM' ,  
'TROPT' , 'AGCM' ,  
::
```

All that being said, things can get more complicated inside components, this is beyond this discussion but for example the FV dycore uses a lagrangian vertical coordinate, so those levels (determined by ak's and bk's) "float" up and down inside the dynamics and are remapped back to the standard ak and bk levels before it finishes and fill exports for the physics and history.

-Bill

[rburns](#) 60 posts since
May 22, 2007 [4. Re: GEOS pressure/vertical levels](#) Jan 9, 2008 4:01 PM

in response to: [wputman](#)

Thanks for the detailed response, Bill.

Even though I don't quite understand the application of ak/bk yet, I can understand why the models wouldn't want to work with pressure levels into the ground. Unfortunately, I am dealing with the MAP06 dataset, so I would not be performing any re-runs of the model. I can check the output datasets though and see if those particular levels are output. Otherwise, I'll have to interpolate maybe.

Thanks!

Rob

[ccruz](#) 79 posts since
Jul 6, 2007 [5. Re: GEOS pressure/vertical levels](#) Jan 18, 2008 10:39 AM

GEOS pressure/vertical levels ...

in response to: [rburns](#) Ok, assuming you are working with pressure levels (i.e. above the boundary layer, as you seem to be doing) to interpolate pressure between levels first compute the pressure ratio as follows:

$$Pr = (\log(P_i) - \log(P_s)) / (\log(P_i) - \log(P_{i+1}))$$

where,

Pr = pressure ratio,

P_i = pressure of the lower bounding level,

P_{i+1} = pressure of the upper bounding level, and

P_s = pressure of the constant pressure surface being selected.

Then, Interpolation of any parameter (wind, height, temperature, relative humidity, etc) is carried out using:

$$X_{\text{new}} = Pr * (X_{i+1} - X_i) + X_i$$

where,

X_{new} = parameter value at interpolated level,

Pr = pressure ratio,

X_i = parameter value at lower bounding level, and

X_{i+1} = parameter value of the upper bounding level.

This can be very easily implemented in a grads script (see grads.iges.org)

I think this approach is a good first order approximation although I don't know where you intend to use your data.

If you get near the bottom it will get more complicated.

Carlos

[jfli](#) 20 posts since

Sep 20, 2007 [6. Re: GEOS pressure/vertical levels](#) Apr 24, 2008 3:36 PM

in response to: [ccruz](#)

Hi,

I have questions on how to output on model levels.

From the script for pressure level output, am I right if I comment out with ##, I can get model level output? If yes, am I doing the correct ## lines?

Thanks,

Frank

```
list(3)%filename: 'geosgcm_moist',
list(3)%template: '%y4%m2%d2_000000z',
list(3)%format: 'CFIO',
```

GEOS pressure/vertical levels ...

```
1. list(3)%mode: 'time-averaged',  
  
list(3)%frequency: 030000,  
list(3)%ref_time: 210000,  
1. list(3)%vscale: 100.0,  
2. list(3)%vunit: 'hPa',  
3. list(3)%vvars: 'log(PLE)' , 'DYN' ,  
4. list(3)%levels: 1000 975 950 925 900 875 850 825 800 775 750 725 700 650 600 550 500 450 400 350  
300 250 215 147 100 70 50 40 30 20 10 7 5 4 3 2 1 0.7 0.5 0.4 0.3 0.2 0.1 0.07 0.05 0.04 0.03 0.02,
```

```
list(3)%fields: 'PHIS' , 'SUPERDYNAMICS' ,  
'QL' , 'MOIST' ,  
'QI' , 'MOIST' ,  
'QR' , 'MOIST' ,  
'RI' , 'MOIST' , 'RICE' ,  
::
```

[ccruz](#) 79 posts since

Jul 6, 2007 [7](#). Re: GEOS pressure/vertical levels Apr 24, 2008 5:47 PM

in response to: [jfli](#) The following settings will produce pressure level output:

```
list(3)%filename: 'geosgcm_moist',  
list(3)%template: '%y4%m2%d2_000000z',  
list(3)%format: 'CFIO',  
list(3)%mode: 'time-averaged',  
list(3)%frequency: 030000,  
list(3)%ref_time: 210000,  
list(3)%vscale: 100.0,  
list(3)%vunit: 'hPa',  
list(3)%vvars: 'log(PLE)' , 'DYN' ,  
list(3)%levels: 1000 975 950 etc...  
list(3)%fields: 'PHIS' , 'SUPERDYNAMICS' , etc...
```

If you comment out list(3)%levels, the output will be on the native grid. Furthermore if vvars is commented out levels will be layer indices. For more information on these settings see [HISTORY.rc settings](#)

[jfli](#) 20 posts since

Sep 20, 2007 [8](#). Re: GEOS pressure/vertical levels Apr 25, 2008 4:00 PM

in response to: [ccruz](#)

Hi,

We are trying to output

GEOS pressure/vertical levels ...

- a. instantaneous
- b. at each 3 hour
- c. at model levels

When we use the following script by taking out lines with **underlined-bold** , the model does not work.

The original script works fine but after deleting the **underlined-bold lines** shown below, the model stop. Are we missing something?

Thanks.

Frank

```
list(3)%filename: 'geosgcm_moist',
list(3)%template: '%y4%m2%d2_000000z',
list(3)%format: 'CFIO',
_ <stron list(3)%frequency: 030000, <br />
_ list(3)%ref_time: 210000, _
list(3)%vscale: 100.0,
+ list(3)%vunit: 'hPa', +
list(3)%vvars: 'log(PLE)', 'DYN',
+ list(3)%levels: 1000 975 950 925 900 875 850 825 800 775 750 725 700 650 600 550 500 450 400 350 300 250
215 147 100 70 50 40 30 20 10 7 5 4 3 2 1 0.7 0.5 0.4 0.3 0.2 0.1 0.07 0.05 0.04 0.03 0.02,+
list(3)%fields: 'PHIS' , 'SUPERDYNAMICS' ,
'QL' , 'MOIST' ,
'QI' , 'MOIST' ,
.
.
```

[ccruz](#) 79 posts since
Jul 6, 2007 [9](#). Re: GEOS pressure/vertical levels Apr 28, 2008 7:36 AM

in response to: [jfli](#) To output :

- a. instantaneous
- b. at each 3 hour
- c. at model levels

only set

```
list(3)%filename: 'geosgcm_moist',
list(3)%template: '%y4%m2%d2_000000z',
list(3)%format: 'CFIO',
list(3)%mode: 'instantaneous',
```

GEOS pressure/vertical levels ...

```
list(3)%frequency: 030000  
list(3)%reftime: 210000  
list(3)%fields: 'PHIS' , 'SUPERDYNAMICS' , etc..
```

For more information on these settings see [HISTORY.rc settings](#).

jfli 20 posts since
Sep 20, 2007 10. Re: GEOS pressure/vertical levels Apr 29, 2008 3:32 PM

in response to: [ccruz](#)

Hi,

I follow the suggestion and run but failed. I checked the error file at /home0/jfli/geos5/e0250/e0250.o606190
there are errors lines:

ERROR: Mixed Vlocation in CFIO mode not allowed unless LEVELS are specified

GEOS_CFIOCreateFromBundle 454

Run 1462

So I take out

```
list(3)%format: 'CFIO',
```

then try it again. It is running and getting some output. May I ask, if this is the correct way for model level output?

Thanks,

Frank

ccruz 79 posts since
Jul 6, 2007 11. Re: GEOS pressure/vertical levels Apr 29, 2008 5:46 PM

in response to: [jfli](#) I tried to read /home0/jfli/geos5/e0250/e0250.o606190 but it does not have the correct permissions.

The error appears to imply that when using CFIO format one must specify the levels. Otherwise you do get output but it is not CFIO (i.e. hdf) format; instead it is a flat grads file with its corresponding control file. Those fields will be on model level output (native grid), not pressure levels.

jfli 20 posts since
Sep 20, 2007 12. Re: GEOS pressure/vertical levels Apr 30, 2008 12:05 AM

in response to: [ccruz](#)

Hi,

I got the model level output by taking out CFIO option.

My other question is re: restart file.

GEOS pressure/vertical levels ...

I am trying to run a simulation using a saved restart file.

1. I change the name of the res file, for example,

"moist_import_restart.e20060518_21z" to "moist_import_restart",

the same to the other restart files.

2. Then I modify the "cap.restart" by setting the date to "20060518 210000" .

May I ask, am I doing the right steps here?

Thanks,

Frank

[ccruz](#) 79 posts since

Jul 6, 2007 [13. Re: GEOS pressure/vertical levels](#) Apr 30, 2008 7:52 AM

in response to: [jfli](#) Yes those are the correct steps. Note that the run.script will do this automatically after every run submission.